Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

Comprehensive pediatric eye and vision examination.

Bibliographic Source(s)

AOA Evidence-Based Optometry Guideline Development Group. Comprehensive pediatric eye and vision examination. St. Louis (MO): American Optometric Association (AOA); 2017. 67 p. [251 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: American Optometric Association. Pediatric eye and vision examination. St. Louis (MO): American Optometric Association; 2002. 57 p. [130 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

= Poor = Fair = Good = Very Good = Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
	Disclosure and Management of Financial Conflict of Interests
	Guideline Development Group Composition
YES	Multidisciplinary Group

YES	Methodologist Involvement
▮▮▮▮▯	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
▮▮▮▯▯	Search Strategy
▮▮▮▮▯	Study Selection
▮▮▮▮▯	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
▮▮▮▮▮	Grading the Quality or Strength of Evidence
▮▮▮▮▮	Benefits and Harms of Recommendations
▮▮▮▮▯	Evidence Summary Supporting Recommendations
▮▮▮▮▮	Rating the Strength of Recommendations
▮▮▮▮▮	Specific and Unambiguous Articulation of Recommendations
▮▮▮▮▯	External Review
▮▮▮▮▯	Updating

Recommendations

Major Recommendations

Definitions for the quality of evidence (A–D) and strength of clinical recommendation levels (Strong Recommendation, Recommendation, Option) are presented at the end of the "Major Recommendations" field.

Comprehensive Pediatric Eye and Vision Examination

Examination Procedures*

Consensus-Based Action Statement: A comprehensive pediatric eye and vision examination should include, but is not limited to:

- Review of the nature and history of the presenting problem, patient and family eye and medical histories, including visual, ocular, general health, leisure and sports activities, and developmental and school performance history of the child
- Measurement of visual acuity
- Determination of refractive status
- Assessment of binocular vision, ocular motility, and accommodation
- Evaluation of color vision (baseline or periodic, if needed, for qualification purposes or if disease related)
- Assessment of ocular and systemic health, including evaluation of pupillary responses, anterior and

posterior segment, peripheral retina, evaluation/measurement of intraocular pressure, and visual field testing.

Refer to section III. Care Process, A. 9 in the original guideline document for a listing of potential benefits and harms of testing.

Evidence Quality: There is a lack of published research to support or refute the use of all of the tests and/or assessments included in this recommendation.
Benefit and Harm Assessment: Implementation of this recommendation is likely to result in the enhanced ability to diagnose any eye or vision problems in infants and children. The benefits of this recommendation were established by expert consensus opinion.

*Note: See Appendix Tables 1, 2, and 3 in the original guideline document for a listing of specific tests by age group.

Testing

Testing of Preschool Children (3 through 5 years of age)

Refraction

Consensus-Based Action Statement: Cycloplegic retinoscopy is the preferred procedure for the first evaluation of preschoolers. It is necessary to quantify significant refractive error in the presence of visual conditions such as strabismus, amblyopia, and anisometropia.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementation of this recommendation is likely to enhance the ability to evaluate and diagnose eye and vision problems in school-age children. The benefits of this recommendation were established by expert consensus opinion.

Testing of School-Age Children (6 through 18 years of age)

Refraction

Consensus-based Action Statement: Cycloplegic retinoscopy is the preferred procedure for the first evaluation of school-age children. It is necessary to quantify significant refractive error in the presence of visual conditions such as strabismus, amblyopia, and anisometropia.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementation of this recommendation is likely to enhance the ability to evaluate and diagnose eye and vision problems in school-age children. The benefits of this recommendation were established by expert consensus opinion.

Color Vision

Consensus-Based Action Statement: Abnormal color vision can affect daily performance of activities involving color discrimination and may interfere with or prevent some occupational choices later in life. Children should be tested as soon as possible for color vision deficiency and the parents/caregivers of children identified with color vision deficiency should be counseled.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementation of this recommendation is likely to increase early detection of color vision deficiency and alert parents/caregivers to any potential effects on a child's education or occupational choices. The benefits of this recommendation were established by expert consensus opinion.

Supplemental Testing

Testing for Learning-Related Vision Problems

Consensus-Based Action Statement: Children at risk for learning-related vision problems should be evaluated by a doctor of optometry.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementation of this recommendation is likely to result in more in-depth evaluation and diagnosis of children with learning-related vision problems. The benefits of this recommendation were established by expert consensus opinion.

Children with Special Needs

Developmental Disabilities

Consensus-Based Action Statement: Many children with developmental or intellectual disabilities have undetected and untreated vision problems and should receive a comprehensive pediatric eye and vision examination.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementation of this recommendation is likely to result in improved quality of life and educational and occupational achievement for these high-risk children. The benefits of this recommendation were established by expert consensus opinion.

Management

Counseling and Education

Consensus-Based Action Statement: At the conclusion of a comprehensive pediatric eye and vision examination, the diagnosis should be explained to the patient/parent/caregiver and related to the patient's symptoms, and a treatment plan and prognosis discussed.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation
Benefit and Harm Assessment: Implementing this recommendation is likely to increase patient/parent/caregiver understanding of any diagnosed eye or vision problems and improve compliance with any recommended treatment. The benefits of this recommendation were established by expert consensus opinion.

Eye and Safety Protection

Evidence-Based Action Statement: Parents/caregivers and children should be educated about potential risks for eye injuries at home, at school, and during sports and recreational activities, and advised about safety precautions to decrease the risk of ocular injury (Pollard, Xiang, & Smith, 2012; Lesniak et al., 2012). Prevention of eye injuries in children should focus on the use of protective eyewear, parental supervision, and include education about both the risks of eye injury and the benefits of protective eyewear (Armstrong et al., 2013).

Evidence Quality: Grade B: Retrospective cohort studies
Level of Confidence: Medium
Clinical Recommendation Strength: Strong Recommendation. This recommendation should be followed unless clear and compelling rationale for an alternative approach is present.
Evidence Statements:
- It is important to discuss eye safety issues with children/parents/caregivers. (Evidence Grade: B)
- Prevention strategies should focus on the use of protective eyewear, parental supervision, and on childhood education about both the risks of eye injury and the utility of protective eyewear. (Evidence Grade: B)

Potential Benefits: Reduction in eye injuries in children

Potential Risks/Harms: None
Benefit and Harm Assessment: Benefits significantly outweigh harms
Potential Costs: Direct cost of counseling as part of a pediatric eye and vision examination
Value Judgments: None
Role of Patient Preferences: Large
Intentional Vagueness: Specific type/form of counseling is not stated, as it is patient specific
Gaps in Evidence: Research is needed to determine the risks and methods of eye protection associated with specific eye injuries in children in order to design appropriate prevention strategies

Ultraviolet Radiation and Blue Light Protection

Consensus-Based Action Statement: All children and their parents/caregivers should be advised about the benefits of the regular use of sunglasses and/or clear prescription glasses that effectively block at least 99% of ultraviolet A (UVA) and ultraviolet B (UVB) radiation, the use of hats with brims when outdoors, and the importance of not looking directly at the sun.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementing this recommendation is likely to decrease patient risk of eye health problems from acute or chronic exposure to UV radiation and blue light. The benefits of this recommendation were established by expert consensus opinion.

Impacts of Near Work and Reduced Time Outdoors on Vision

Evidence-Based Action Statement: Patients/parents/caregivers should be counseled about the benefits to children's vision of spending more time outdoors (Gwiazda et al., 2014; Jones-Jordan et al., 2011; Jones-Jordan et al., 2012; Lin et al., 2014).

Evidence Quality: Grade B. Randomized clinical trial, Prospective cohort studies, Cross-sectional study
Level of Confidence: Medium
Clinical Recommendation Strength: Recommendation. This recommendation should generally be followed, but remain alert for new information.
Evidence Statements:
- More time spent outdoors and less time indoors doing near work may slow axial elongation and prevent high myopia thereby reducing the risk of developing sight-threatening conditions such as retinal detachment and myopic retinopathy. (Evidence Grade: A)
- More time outside may decrease myopia progression. Less outdoor/sports activity before myopia onset may exert a stronger influence on the development of myopia than near work. (Evidence Grade: B)
- Outdoor time and near work do not have a major effect on myopia progression. (Evidence Grade: B)
- Higher levels of outdoor activity were associated with lower amounts of myopia in primary school students. (Evidence Grade: D)

Potential Benefits: Implementation of this recommendation is likely to help reduce the development and progression of myopia in children
Potential Risks/Harms: None
Benefit and Harm Assessment: Benefits significantly outweigh harms
Potential Costs: Direct cost of counseling as part of a pediatric eye and vision examination and parental/caregiver time off from work
Value Judgments: None
Role of Patient Preferences: Moderate
Intentional Vagueness: Specific type/form of counseling is not stated, as it is patient specific
Gaps in Evidence: Research is needed on the effects and possible interaction of outdoor activity and near work on myopia in children

Coordination and Frequency of Care

Frequency of Care

Infants and Toddlers (newborn through 2 years of age)

Evidence-Based Action Statement: Infants should receive an in-person comprehensive eye and vision assessment between 6 and 12 months of age for the prevention and/or early diagnosis and treatment of sight-threatening eye conditions and to evaluate visual development (Wang et al., 2013; Eibschitz-Tsimhoni et al., 2000; Atkinson et al., 2007).

Evidence Quality: Grade B: Prospective cohort studies, Diagnostic study
Level of Confidence: High
Clinical Recommendation Strength: Strong Recommendation. This recommendation should be followed unless clear and compelling rationale for an alternative approach is present.
Evidence Statements:

Preterm infants with a history of retinopathy of prematurity should be closely monitored for the development of high myopia, astigmatism, and anisometropia. (Evidence Grade: B)
Early visual examination in infants for amblyopia and amblyopic risk factors can lower the prevalence and severity of amblyopia in children. (Evidence Grade: B)
Assessment of infant refractive error can identify not only vision problems, but also potential developmental difficulties. Hyperopic infants may show deficits in many visuocognitive, spatial, visuomotor, and attention tests. (Evidence Grade: B)

Potential Benefits: Early identification and treatment of eye and vision problems
Potential Risks/Harms: None
Benefit and Harm Assessment: Benefits significantly outweigh harms
Potential Costs: Direct cost of testing and parent/caregiver time off from work
Value Judgments: None
Role of Patient Preferences: Moderate
Intentional Vagueness: None
Gaps in Evidence: None identified

Preschool Children (3 through 5 years of age)

Evidence-Based Action Statement: Preschool age children should receive an in-person comprehensive eye and vision examination at least once between the ages of 3 and 5 to prevent and/ or diagnose and treat any eye or vision conditions that may affect visual development (Holmes et al., 2011; U.S. Preventive Services Task Force, 2011; VIP-HIP Study Group et al., 2016; Dobson et al., 2009; Kemper et al., 2011).

Evidence Quality: Grade B. Systematic Review, Case series, Cross-sectional study
Level of Confidence: Medium
Clinical Recommendation Strength: Strong Recommendation. This recommendation should be followed, unless clear and compelling rationale for an alternative approach is present.
Evidence Statements:

Amblyopia is a treatable condition in children and adolescents (Evidence Grade: A); however, amblyopia is more responsive to treatment among children younger than 7 years of age.
Uncorrected hyperopia in 4 and 5 year old children has been associated with delays in the development of early literacy. (Evidence Grade: C)
Spectacle correction of astigmatism during the preschool years can result in significantly improved best-corrected visual acuity by kindergarten age. (Evidence Grade: C)
The U.S. Preventive Services Task Force recommends that children have their vision screened at least once between the ages of 3 and 5 years of age; (Evidence Grade: B) however, gaps exist in the delivery of preschool vision screening and rates of screening are low, particularly in 3 year old children. (Evidence Grade: C)

Potential Benefits: Early identification and treatment of eye and vision problems
Potential Risks/Harms: None
Benefit and Harm Assessment: Benefits significantly outweigh harms
Potential Costs: Direct cost of testing and parent/caregiver time off from work

Value Judgments: None
Role of Patient Preferences: Moderate
Intentional Vagueness: None
Gaps in Evidence: None identified

School-age Children (6 through 11 and 12 through 18 years of age)

Evidence-Based Action Statement: School-age children should receive an in-person comprehensive eye and vision examination before beginning school to diagnose, treat, and manage any eye or vision conditions (Borsting et al., 2012; Jones-Jordan et al., 2010; VIP-HIP Study Group et al., 2016; Shankar, Evans, & Bobier, 2007; van Rijn et al., 2014; Rouse et al., 2009).

Evidence Quality: Grade B. Prospective cohort studies, Case-control study, Cross-sectional study.
Level of Confidence: Medium
Clinical Recommendation Strength: Strong Recommendation. This recommendation should be followed unless clear and compelling rationale for an alternative approach is present.
Evidence Statements:
- Children should receive an eye examination at the beginning of primary school to diagnose the onset of myopia. (Evidence Grade: B)
- Hyperopia can affect the development of literacy skills. Children with uncorrected hyperopia show reduced performance in the acquisition of emergent literacy skills. (Evidence Grade: C)
- Correction of hyperopia may, under specific conditions, lead to increased reading speed; therefore, eye examinations to diagnose uncorrected hyperopia are recommended. (Evidence Grade: B)
- Early diagnosis and treatment of an accommodative or vergence problem may reduce the negative impact on academic performance. (Evidence Grade: B)
- Children with attention-deficit/hyperactivity disorder (AD/HD) or related learning problems may benefit from comprehensive vision evaluation to assess the presence of convergence insufficiency. (Evidence Grade: D)
- Treatment of convergence insufficiency has been associated with reduction in the frequency of adverse academic behaviors. (Evidence Grade B)

Potential Benefits: Early identification and treatment of eye and vision problems
Potential Risks/Harms: None
Benefit and Harm Assessment: Benefits significantly outweigh harms
Potential Costs: Direct cost of testing and parent/caregiver time off from work
Value Judgments: None
Role of Patient Preferences: Moderate
Intentional Vagueness: None
Gaps in Evidence: None identified

Evidence-based Action Statement: Children with myopia should have an in-person comprehensive eye and vision examination at least annually, or as frequently as recommended (especially until age 12), because of the potential for rapid myopia progression (Gwiazda et al., 2014; Comet Group, 2013).

Evidence Quality: Grade B. Randomized clinical trial, Prospective cohort study
Level of Confidence: Medium
Clinical Recommendation Strength: Strong Recommendation. This recommendation should be followed unless clear and compelling rationale for an alternative approach is present.
Evidence Statements:
- Children with myopia should have an examination at least annually or as frequently as their doctor recommends until the age of 12 because of rapid myopia progression. (Evidence Grade: B)
- When both parents have myopia, children are at higher risk for progression and should be examined more than once per year. (Evidence Grade: A)

Potential Benefits: Early identification and treatment of eye and vision problems
Potential Risks/Harms: None

Benefit and Harm Assessment: Benefits significantly outweigh harms
Potential Costs: Direct cost of testing and parent/caregiver time off from work
Value Judgments: None
Role of Patient Preferences: Moderate
Intentional Vagueness: None
Gaps in Evidence: None identified

Consensus-Based Action Statement: School-age children should receive an in-person comprehensive eye and vision examination annually to diagnose, treat, and manage any eye or vision problems.

Evidence Quality: There is a lack of published research to support or refute the use of this recommendation.
Benefit and Harm Assessment: Implementing this recommendation is likely to result in earlier diagnosis and treatment of eye and vision problems and improved visual function. The benefits of this recommendation were established by expert consensus opinion.

Recommended Eye Examination Frequency for Pediatric Patients**

Examination Interval		
Patient Age	**Asymptomatic/Low-Risk**	**At-Risk**
Birth through 2 years	At 6 to 12 months of age	At 6 to 12 months of age, or as recommended
3 through 5 years	At least once between 3 and 5 years of age	At least once between 3 and 5 years of age, or as recommended
6 through 18 years	Before first grade and annually thereafter	Before first grade and annually, or as recommended, thereafter

**The American Optometric Association Clinical Practice Guidelines provide more information on other eye and vision disorders and their risk factors.

Definitions

Key to Quality of Evidence

Grade	Quality of Evidence Levels
A	Data derived from well-designed, randomized clinical trials (RCTs), systematic reviews; meta-analyses; or diagnostic studies (Grade A) of relevant populations with a validated reference standard. Grade A diagnostic studies do not have a narrow population or use a poor reference standard and are not case control studies of diseases or conditions.
B	RCTs with weaker designs; cohort studies (retrospective or prospective); or diagnostic studies (Grade B). Grade B diagnostic studies have only one of the following: a narrow population or the sample used does not reflect the population to whom the test would apply or uses a poor reference standard or the comparison between the test and reference standard is not blinded or are case control studies of diseases or conditions.
C	Studies of strong design, but with substantial uncertainty about conclusions, or serious doubts about generalization, bias, research design, or sample size. Nonrandomized trials; case control studies (retrospective or prospective); or diagnostic studies (Grade C). Grade C diagnostic studies have at least 2 or more of the following: a narrow population or the sample used does not reflect the population to whom the test would apply or uses a poor reference standard or the comparison between the test and reference standard is not blinded or are case control studies of diseases or conditions.
D	Cross sectional studies; case reports/series; reviews; position papers; expert opinion; or reasoning from principle.

Strength of Clinical Recommendation Levels

Strong Recommendation: The benefits of the recommendation clearly exceed the harms (or the harms clearly exceed the benefits in the case of a negative recommendation) and the quality of evidence is

excellent (Grade A or B). In some clearly identified circumstances, a strong recommendation may be made on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.

This recommendation should be followed unless clear and compelling rationale for an alternative approach is present.

Recommendation: The benefits of the recommendation exceed the harms (or the harms exceed the benefits in the case of a negative recommendation) but the quality of evidence is not as strong (Grade B or C). In some clearly identified circumstances, a recommendation may be made on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.

This recommendation should generally be followed, but remain alert for new information.

Option: The benefits of the recommendation exceed the harms (or the harms exceed the benefits in the case of a negative recommendation) but the quality of evidence is low (Grade D) or well-done studies (Grade A, B, or C) show little clear advantage of one approach versus another. In some clearly identified circumstances, an option may be elevated to a recommendation even with lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.

There should be an awareness of this recommendation, but a flexibility in clinical decision-making, as well as remaining alert for new information.

Clinical Algorithm(s)

An algorithm titled "Comprehensive Pediatric Eye and Vision Examination: a Flowchart" is provided as Appendix Figure 1 in the original guideline document.

Scope

Disease/Condition(s)

Eye and vision disorders

Guideline Category

Diagnosis

Evaluation

Management

Prevention

Screening

Clinical Specialty

Optometry

Pediatrics

Preventive Medicine

Intended Users

Health Care Providers

Optometrists

Patients

Physicians

Guideline Objective(s)

- To describe procedures for evaluation of the eye health and vision status of infants and children and to provide recommendations for timely diagnosis and, when necessary, referral for consultation with, or treatment by, another health care provider
- To assist doctors of optometry and ophthalmologists involved in providing eye and vision examinations for infants and children
- To help achieve the following objectives:
    - Recommend an optimal timetable for comprehensive eye and vision examinations for infants and children (newborn through 18 years of age)
    - Suggest appropriate procedures to effectively examine the eye health, vision status, and ocular manifestations of systemic disease of infants and children
    - Reduce the risks and adverse effects of eye and vision problems in infants and children through prevention, education, early diagnosis, treatment, and management
    - Inform and educate patients, parents/caregivers, and other health care providers about the importance of eye health and good vision, and the need for and frequency of pediatric eye and vision examinations

Target Population

- Infants and toddlers (newborn through 2 years of age)
- Preschool children (3 years through 5 years of age)
- School-age children (6 through 18 years of age)

Interventions and Practices Considered

<u>Diagnosis/Evaluation</u>

Examination procedures
Testing of preschool and school-age children
    Refraction (cycloplegic retinoscopy)
    Color vision
Supplemental testing (testing for learning-related vision problems)
Consideration for children with special needs (developmental or intellectual disabilities)

<u>Management/Prevention</u>

Patient counseling and education
    Eye safety and protection
    Protection from ultraviolet (UV) exposure
    Impact of near work and reduced time outdoors on vision
    Myopia control
Coordination and frequency of care

Major Outcomes Considered

- Accuracy of diagnostic tests
- Effectiveness of comprehensive eye and vision examination
- Risks and harms

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

This guideline was developed by the American Optometric Association (AOA) Evidence-Based Optometry Guideline Development Group (GDG). Clinical questions to be addressed in the guideline were identified and refined during an initial meeting of the GDG and served as the basis for a search of the clinical and research literature.

An English language search of the medical literature for the eye and vision examination of children birth through 18 years of age, for the time period January 2005 through October 2016 was conducted by trained researchers. If the search did not produce results, the search parameters were extended an additional 5 years.

Search Inclusion Criteria (must meet all):

English Studies
Study addresses the clinical question(s)
Paper meets the age group being addressed (0 to 18 years for pediatrics)
Searched by question(s) formulated at the AOA Call to Question Meeting attended by the GDG
Using all similar and relevant terms as defined by the GDG

Exclusion Criteria (meeting *any* of the below):

Non-English studies
Animal studies
Studies outside of the patient age range
Studies not addressing any topic of the clinical questions searched

In addition, a review of selected earlier research publications was conducted based on previous versions of this guideline. The literature search was conducted using the following electronic databases:

Agency for Healthcare Research and Quality (AHRQ)
American Academy of Optometry (AAO)
American Academy of Neurology
American Association for Pediatric Ophthalmology and Strabismus (AAPOS)
American Journal of Optometry and Physiological Optics
Centers for Disease Control and Prevention, National Center for Health Statistics
Cochrane Library
Developmental Medicine & Child Neurology (DMCN)
Elsevier
Epidemiology
Google Scholar
JAMA Ophthalmology

Journal of Adolescent Health Care (JAHC)
Medline Plus
National Eye Institute
National Institute of Health Public Access (NIH)
National Guideline Clearinghouse
Neurology
Ophthalmic Epidemiology
Ophthalmology
PubMed
Other medical journals meeting the search criteria will be included in this list when used

See the "Literature Search Process" document (see the "Availability of Companion Documents" field) for search terms.

All references meeting the criteria were reviewed to determine their relevance to the clinical questions addressed in the guideline.

Number of Source Documents

A told of 251 background and graded references were used in the guideline, which yielded 6 evidence-based action statements, 9 consensus-based action statements, and 9 clinical notes and statements.

See the flow chart in Section VI of the original guideline document for details of the article selection process.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Key to Quality of Evidence

Grade	Quality of Evidence Levels
A	Data derived from well-designed, randomized clinical trials (RCTs), systematic reviews; meta-analyses; or diagnostic studies (Grade A) of relevant populations with a validated reference standard. Grade A diagnostic studies do not have a narrow population or use a poor reference standard and are not case control studies of diseases or conditions.
B	RCTs with weaker designs; cohort studies (retrospective or prospective); or diagnostic studies (Grade B). Grade B diagnostic studies have only one of the following: a narrow population or the sample used does not reflect the population to whom the test would apply or uses a poor reference standard or the comparison between the test and reference standard is not blinded or are case control studies of diseases or conditions.
C	Studies of strong design, but with substantial uncertainty about conclusions, or serious doubts about generalization, bias, research design, or sample size. Nonrandomized trials; case control studies (retrospective or prospective); or diagnostic studies (Grade C). Grade C diagnostic studies have at least 2 or more of the following: a narrow population or the sample used does not reflect the population to whom the test would apply or uses a poor reference standard or the comparison between the test and reference standard is not blinded or are case control studies of diseases or conditions.
D	Cross sectional studies; case reports/series; reviews; position papers; expert opinion; or reasoning from principle.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Each article was assigned to two clinicians who independently reviewed and graded the quality of evidence and the clinical recommendations derived from the article, based on a previously defined system for grading quality (see the "Rating Scheme for the Strength of the Evidence" field). If discrepancies were found in the grading results, the article was assigned to an independent third reader for review and grading.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

This guideline was developed by the American Optometric Association (AOA) Evidence-Based Optometry Guideline Development Group (GDG). Clinical questions to be addressed in the guideline were identified and refined during an initial meeting of the GDG and served as the basis for a search of the clinical and research literature.

During six articulation meetings (three face-to-face and three using a Webex platform) of the Evidence-Based Optometry Guideline Development Reading Group (GDRG), all evidence was reviewed and clinical recommendations were developed. The strength level of clinical recommendations was based on the quality grade of the research and the potential benefits and harms of the procedure or therapy recommended. Where high-quality evidence to support a recommendation was weak or lacking, a group consensus was required to approve any consensus recommendations.

Clinical recommendations in this guideline are evidence-based statements regarding patient care that are supported by the scientific literature or consensus of professional opinion when no quality evidence was discovered.

See the original guideline document for "AOA's 14 Steps to Evidence-Based Clinical Practice Guideline Development" for a description of all steps involved in guideline development.

Rating Scheme for the Strength of the Recommendations

Strength of Clinical Recommendation Levels

Strong Recommendation: The benefits of the recommendation clearly exceed the harms (or the harms clearly exceed the benefits in the case of a negative recommendation) and the quality of evidence is excellent (Grade A or B). In some clearly identified circumstances, a strong recommendation may be made on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.

This recommendation should be followed unless clear and compelling rationale for an alternative approach is present.

Recommendation: The benefits of the recommendation exceed the harms (or the harms exceed the benefits in the case of a negative recommendation) but the quality of evidence is not as strong (Grade B or C). In some clearly identified circumstances, a recommendation may be made on lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.

This recommendation should generally be followed, but remain alert for new information.

Option: The benefits of the recommendation exceed the harms (or the harms exceed the benefits in the case of a negative recommendation) but the quality of evidence is low (Grade D) or well-done studies (Grade A, B, or C) show little clear advantage of one approach versus another. In some clearly identified circumstances, an option may be elevated to a recommendation even with lesser evidence when high-quality evidence is impossible to obtain and the anticipated benefits strongly outweigh the harms.

There should be an awareness of this recommendation, but a flexibility in clinical decision-making, as well as remaining alert for new information.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

Review and editing of the draft guideline by the Evidence-Based Optometry Guideline Development Group (GDG) required one face-to-face meeting and three additional Draft Reading Meetings using a Webex platform. The final Peer Review draft was reviewed and approved by the GDG by conference call, then made available for peer and public review for 30 days for numerous stakeholders (individuals and organizations). Comments were promoted and encouraged. All suggested revisions were reviewed and, if accepted by the GDG, incorporated into the guideline. All peer and public comments and all actions (and inactions) were recorded.

The guideline was approved by the American Optometric Association Board of Trustees on February 12, 2017.

See the original guideline document for "AOA's 14 Steps to Evidence-Based Clinical Practice Guideline Development" for a description of all steps involved in drafting and reviewing the guideline document.

Evidence Supporting the Recommendations

References Supporting the Recommendations

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Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for evidence-based recommendations (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Potential Benefits of Testing

The potential benefits of a comprehensive pediatric eye and vision examination include:

- Optimizing visual function through diagnosis, treatment, and management of refractive, ocular motor, accommodative, and binocular vision problems
- Preventing and/or minimizing vision loss through early diagnosis, treatment, and management of ocular health conditions
- Detecting systemic disease and referring for appropriate care
- Counseling and educating patients/parents/caregivers on current conditions and preventive care to maintain ocular and systemic health and visual function, and on the relationship between vision problems and early learning

See also the "Potential Benefits" sections in the "Major Recommendations" field for specific benefits of evidence-based recommendations.

Potential Harms

Potential Harms of Testing

Potential harms associated with a comprehensive pediatric eye and vision examination may include:

- Patient or parent/caregiver anxiety about testing procedures or resulting diagnosis
- Adverse ocular and/or systemic reactions and/or temporary visual disturbances resulting from testing, or allergic responses to diagnostic pharmaceutical agents or materials used
- Missed or misdiagnosis of eye health or vision problems
- Unnecessary referral or treatment

See also the "Potential Risks/Harms" sections in the "Major Recommendations" field for specific risks or

harms for evidence-based recommendation.

Qualifying Statements

Qualifying Statements

- Recommendations made in this guideline do not represent a standard of care. Instead, the recommendations are intended to assist the clinician in the decision-making process. Patient care and treatment should always be based on a clinician's independent professional judgment, given the patient's circumstances, and in compliance with state laws and regulations.
- The information in this guideline is current to the extent possible as of the date of publication.

Implementation of the Guideline

Description of Implementation Strategy

Effective multifaceted implementation strategies targeting all relevant populations affected by clinical practice guidelines (CPGs) should be employed by implementers to promote adherence to trustworthy guidelines.

American Optometric Association (AOA) Process:

> The AOA Health Promotions Committee is responsible for the released guideline's translation into care. They promote the guideline on the AOA Web site, through the media, to AOA State Affiliates, optometric schools and colleges, Facebook and Twitter.
> They also produce a lecture slide series to be given at state, regional and national meetings where doctors and other caregivers gather for continuing education.

Guideline developers should structure the format, vocabulary, and content of CPGs (e.g., specific statements of evidence, the target population) to facilitate ready implementation of computer-aided clinical decision support (CDS) by end-users.

AOA Process:

> The Guideline Development Group includes a patient and a patient advocate representative to assist in guideline writing for optimum patient and public understanding.
> The guideline posting to the AOA Web site (www.AOA.org) is made available to the public and is an electronic format that can be magnified for easier viewing.
> The guideline is also available in pdf format and is sent out upon request.

Implementation Tools

Clinical Algorithm

Patient Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

AOA Evidence-Based Optometry Guideline Development Group. Comprehensive pediatric eye and vision examination. St. Louis (MO): American Optometric Association (AOA); 2017. 67 p. [251 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2017

Guideline Developer(s)

American Optometric Association - Professional Association

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Guideline Committee

American Optometric Association (AOA) Evidence-Based Optometry Guideline Development Group

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American Optometric Association (AOA) Evidence-Based Optometry Guideline Development Group

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Financial Disclosures/Conflicts of Interest

The Evidence-Based Optometry Guideline Development Group and other guideline participants provided full written disclosure of conflicts of interest prior to each meeting and prior to voting on the quality of evidence or strength of clinical recommendations contained within this guideline.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: American Optometric Association. Pediatric eye and vision examination. St. Louis (MO): American Optometric Association; 2002. 57 p. [130 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American Optometric Association (AOA) Web site .

Availability of Companion Documents

The following are available:

> Evidence-based clinical practice guideline. Comprehensive pediatric eye and vision examination. Literature search process. St. Louis (MO): American Optometric Association (AOA); 2016 Dec. 1 p. Available from the American Optometric Association (AOA) Web site .
> The AOA's evidence-based process. St. Louise (MO): 2015 May. 1 p. Available from the AOA Web site .

Patient Resources

The following are available:

Infant vision: birth to 24 months of age. Available from the American Optometric Association (AOA) Web site .
Preschool vision: 3 to 5 years of age. Available from the AOA Web site .
School-aged vision: 6 to 18 years of age. Available from the AOA Web site .

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

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